User's Manual

for the

Astro-Smart

Integrated Dew Annihilator

Integrated Differential Dew Heater Module (Model: iDA-M)

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Contents

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A. Overview

Astro-Smart LLC is the innovator of this elegant solution to your dew problem. We incorporate the Integrated Dew Annihilator into the fork arm of the very telescope you are using. Most users of the LX200 GPS/R/ACF and RCX400 don't use the battery compartment to run their telescope. Our unique approach offers a clean and efficient use of this space to bring the dew control you need. We utilize the wasted space of your telescope to minimize loading and wire clustering to provide a complete replacement solution to the existing battery compartment and cover. The Integrated Dew Annihilator allows your investment to be brought back to its original condition without alteration.

Figure 1: Integrated Dew Annihilator
(Model: iDA-M)

The Astro-Smart Integrated Dew Annihilator (Model: iDA-M) is currently offered for Meade LX200 GPS/R/ACF and RCX400 telescopes. The Integrated Dew Annihilator was designed with the same Astro-Smart USER-Friendly design philosophy as all our other products:

-Usable
-Serviceable
-Elegant
-Reliable
...USER-Friendly

It is this integrated module that incorporates a four port heater capability controlled by two channels using two remote temperature sensors (one optional). It will work with one remote temperature sensor or with a second remote sensor (available separately) making your corrector dew control independent from your eyepiece or guidescope dew control for instance.

B. Contents Included

1. User Manual for Integrated Dew Annihilator (Model: iDA-M).
2. Integrated Dew Annihilator (Model: iDA-M)
3. Power cable with white 2-pin circuit board connector and the 2.5mm DC power connector.
4. Remote Sensor

C. Specifications

The Integrated Dew Annihilator (Model: iDA-M) requires the following:

- 12 Volts at 3 amps minimum
  Note: This current drawn through the Integrated Dew Annihilator (Model: iDA-M) is dependent on the resistance of each dew strap being used with the Integrated Dew Annihilator (Model: iDA-M). The total current for all the dew straps must not exceed the power supply current rating.

The total resistance of all the dew heater straps used with the Integrated Dew Annihilator (Model: iDA-M) must follow this equation for SAFE operation:

$$\frac{\text{Current Rating of Power Supply}}{\text{Voltage output of Power Supply}} = \frac{1}{R_{strap\ 1}} + \frac{1}{R_{strap\ 2}} + \frac{1}{R_{strap\ 3}} + \frac{1}{R_{strap\ 4}}$$

Astro-Smart LLC assumes no responsibility

- Center: positive voltage, sleeve: ground [See Figure 2].

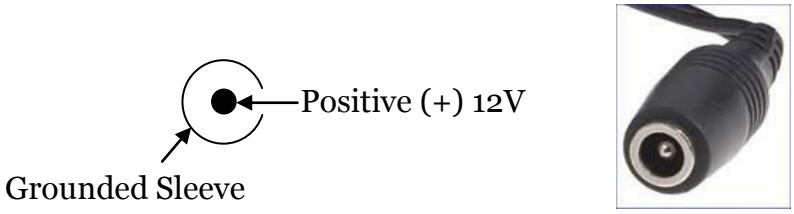

Figure 2 DC power plug

- Uses dew straps manufactured by other astronomical vendors (You must verify usability via the equation above).

D. Design Features

The Astro-Smart Integrated Dew Annihilator (Model: iDA-M) has these innovative and unique features:

- Efficient and elegant use of the internal space of your telescope. This minimizes the cumbersome use and Buck Rogers/octopus look of your setup.
- It is lightweight. Yet aids balancing when used in the east fork arm.
- High quality components and construction. Astro-Smart uses only the best quality components.
- It can keep optical surfaces free of moisture in many different circumstances.
- High quality design employs multi-layer circuit boards with conformal coatings.

E. Basic Functionality

The user simply adjusts the temperature differential based on local current ambient and dew temperature conditions. In clear and bright view, the Integrated Dew Annihilator (Model: iDA-M) displays the above ambient temperature differential setting via a bar graph showing each degree Celsius temperature difference. The display is also calibrated for Fahrenheit degrees as well. Each Integrated Dew Annihilator (Model: iDA-M) comes with one remote sensor. You simply co-locate the sensor head with your primary heater.

Figure 3 displays the normal LX200 GPS/R/ACF or RCX400 battery compartment, the installed 4 port controller Integrated Dew Annihilator (Model: iDA-M), the circuit board, and a closer view of the Temperature Scale.

Figure 3 Views of the Integrated Dew Annihilator (Model: iDA-M)

F. How to Use

1. Power Cable Routing

Before installing the Integrated Dew Annihilator (Model: iDA-M) into your telescope read this section to determine how you will route your power cable.

The Integrated Dew Annihilator (Model: iDA-M) is powered through the provided 12V 2.5mm DC power plug. This plug can be routed any way that is convenient to the user.

A. One option (Option A) is to run the power wire through the front of the Integrated Dew Annihilator (Model: iDA-M), to the front panel area, and then along the telescope power cable [See Figure 4]. This is a simple direct approach that keeps all your power cables bundled. You can simply use Velcro or other fasteners to keep the cables together.

Figure 4 Power cable routing Option A

B. Another option (Option B) for power cable routing is through the back of the Integrated Dew Annihilator (Model: iDA-M), through the fork arm, into and through the fork arm's lower plastic cover [See Figure 5]. This is a little more tricky to accomplish, but requires no modification to your telescope. This option allows the power cable to be routed near the main telescope rotating area, yet still allows the Integrated Dew Annihilator and telescope power cables to be bundled together as mentioned with the first option above.

Figure 5 Power cable routing Option B

C. The cleanest power cable routing solution (Option C) requires modification to your telescope and may void your warranty. Because of this it is not presented here, you can find this procedure at various URLs on the web. Briefly, it involves converting the telescope's existing internal battery compartment wires along with a 2.5mm DC power plug mounted to the telescope's bottom plate. This allows complete pass-through and least amount of potential cable wrap. Again, Astro-Smart does not provide instructions for this as it may void your warranty. For a fee Astro-Smart will perform this modification for you. Please contact us for details.

2. Installation

The following steps when followed will allow you to install the Integrated Dew Annihilator (Model: iDA-M) into your telescope safely and properly.

1. Read this User Manual entirely before proceeding.

   Read this User Manual before proceeding any further.

2. Determine how you will route your power cable.

   See Section 1 before proceeding.

3. Select the fork arm into which you wish to place the Integrated Dew Annihilator

   You may wish to select the east fork arm to aid in slightly preloading the Right Ascension (RA) gear with the small weight that the Integrated Dew Annihilator (Model: iDA-M) will provide.

4. Remove the appropriate form arm battery cover.

   Store the battery cover that you removed in a safe place so that you can return the telescope to its original configuration if you wish to in the future.

5. Unpack the Integrated Dew Annihilator (Model: iDA-M) from the box.

6. Route the Integrated Dew Annihilator (Model: iDA-M) power cable.
   a. If you are routing through the front panel (Option A)
      then Go To Step 7 on Page 9.
   b. If you are routing through the fork arm (Option B)
      then Go To Step 8 on Page 11.

7. Routing power cable through the front panel:
    a. IF you are routing the power cable through the front of the Integrated Dew Annihilator (Model: iDA-M) Module then connect the white connector end of the power cable to the circuit board observing the correct orientation (The white connector is designed to fit only one way.) [See Figure 6.]

WARNINIG: BE CAUTIOUS do not force the white connector onto the circuit board the wrong way. Astro-Smart is not responsible for failure to heed this warning.

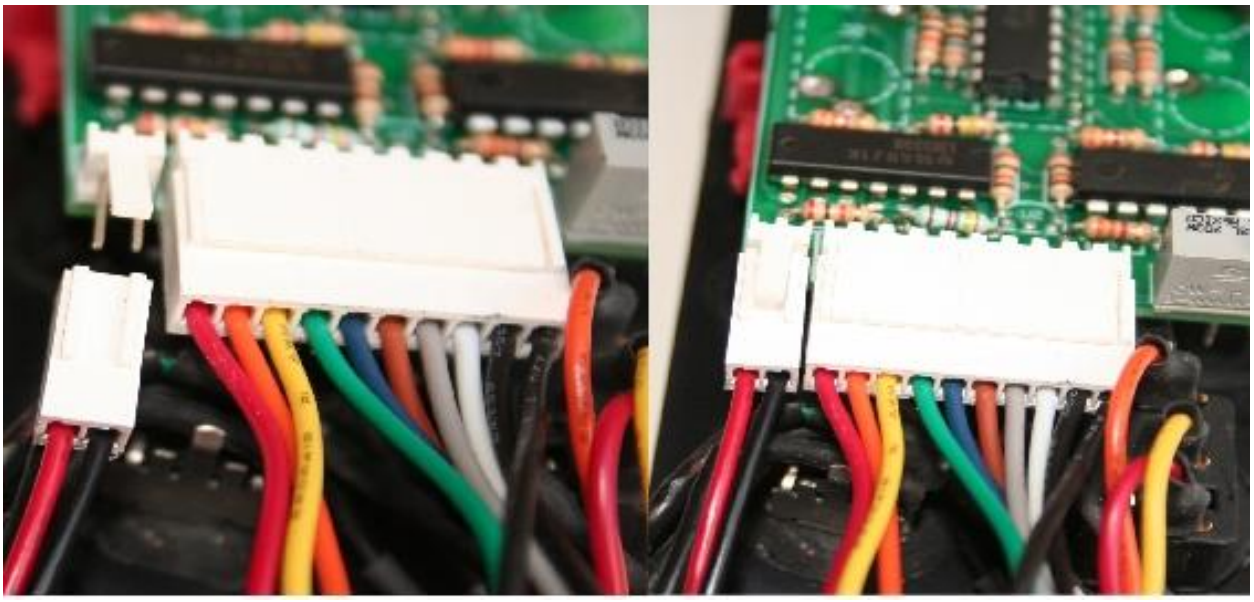

Figure 6 Connecting Power Cable to circuit board

b. As you proceed with Step c carefully route the power cable so it will fit under the Integrated Dew Annihilator (Model: iDA-M) Module cover. [See Figure 7.]

c. Continue to route the power cable along with other cables as desired.

You may want to consider using Velcro wraps or other plastic cable routers that have an adhesive back.

Figure 7 Routing power cable through Integrated Dew Annihilator (Model: iDA-M) front panel

d. **Continue with Step 9 on Page 14 .**

8. Routing power cable through the fork arm:
    a. Loosen the hex (allen) set-screw(s) which retain the plastic fork arm bottom located on the sides of the metal fork arms.
    b. Find a convenient gap between the plastic fork arm bottom and the metal fork arm [See Figure 8].

This will be the exit point of the power cable from the fork arm.

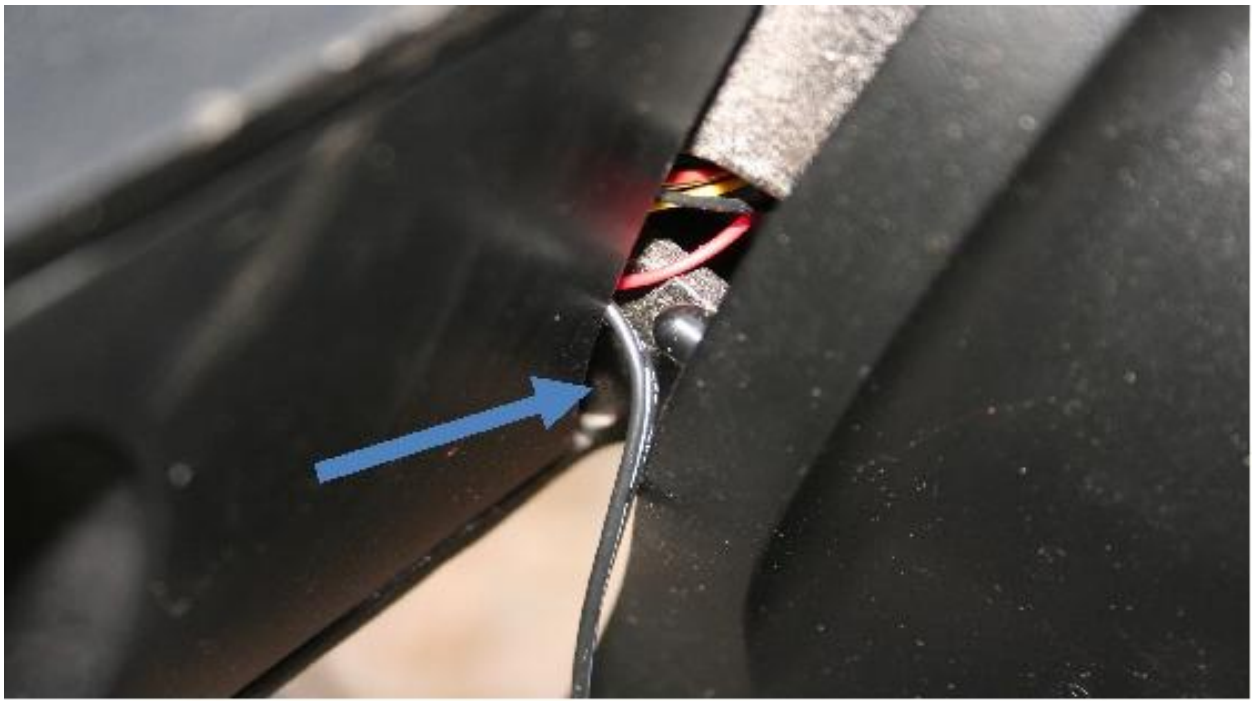

Figure 8 Example gap location for power cable exit

c. Loosen the hex screw of the fork arm [See Figure 9].

Figure 9 Loosen the hex screw of the fork arm.

d. Remove the plastic fork arm bottom by sliding outward [See Figure 10].

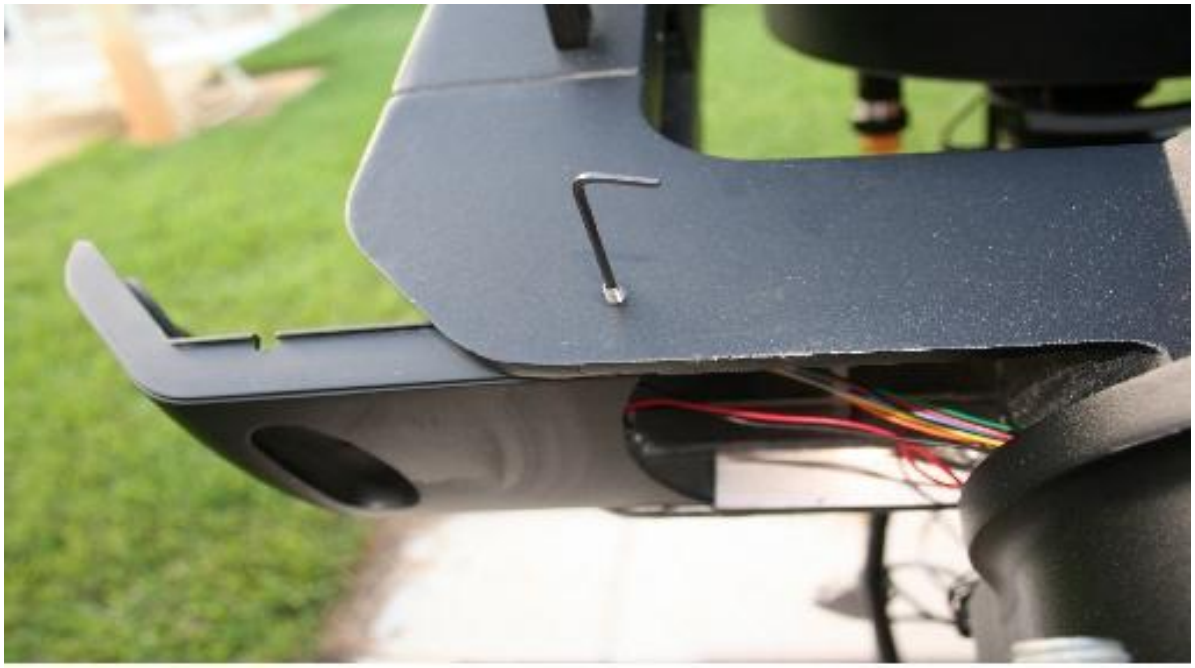

Figure 10 Removal of plastic fork arm bottom

e. Route the power cable through one of the two rectangular cutouts (holes) found in the bottom of the fork arm [See Figure 11].

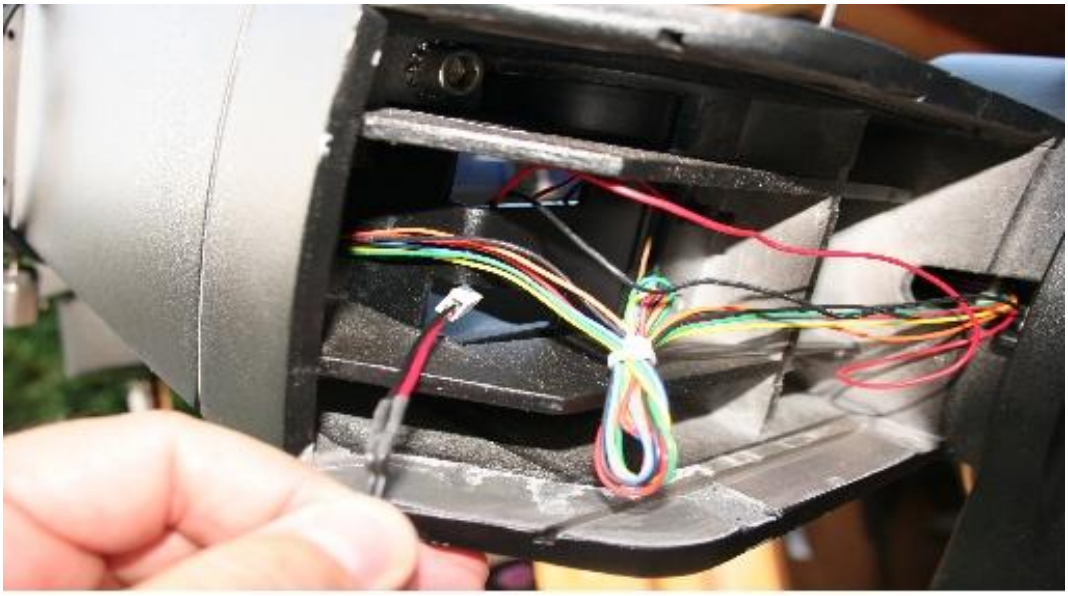

Figure 11 Routing power cable though rectangular cutout

f. Feed power cable through the plastic battery compartment housing.
g. Pull the power cable through enough to provide you with sufficient cable to connect the white connector to the circuit board [See Figure 12].

Figure 12 Power cable through battery compartment

h. Connect the white circuit board connector to the circuit board observing the correct orientation (The white connector is designed to fit only one way.) [See Figure 13.]

WARNINIG: BE CAUTIOUS do not force the white connector onto the circuit board the wrong way. Astro-Smart is not responsible for failure to heed this warning.

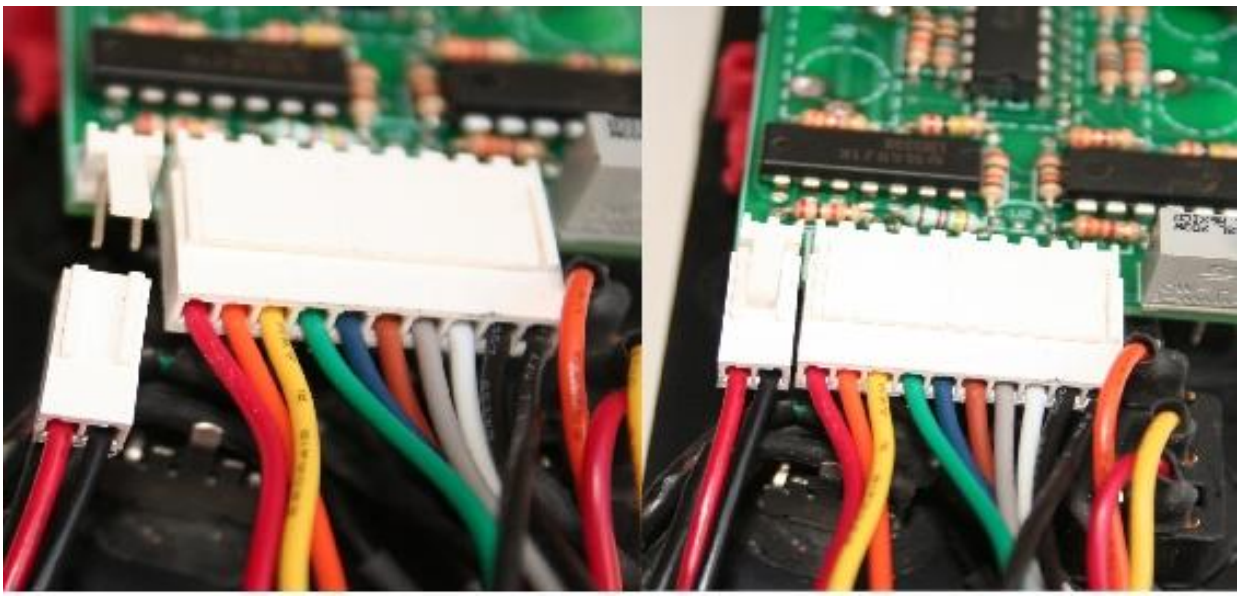

Figure 13 Connecting Power Cable to circuit board

9. Once the power cable white connector is properly connected to the circuit board, insert the Integrated Dew Annihilator (Model: iDA-M) Module into the battery

Ensure the Integrated Dew Annihilator (Model: iDA-M) retaining clasp at the top securely engages the plastic battery compartment housing. This is

10. Ensure the Power Switch is in the OFF position [See
11. Figure 16, Page 17, item (D)].
12. Ensure the Temperature Differential Setting Knob is rotated all the way Counter-Clockwise.

Steps 10 and 11 prepare the Integrated Dew Annihilator (Model: iDA-M) for operations, see Section 4 on Page 19.

13. Connect the Remote Sensor cable that was supplied with the Integrated Dew Annihilator into the Remote Sensor Plug [See
14. Figure 16, Page 17, item (C)].

If you purchased the 2nd Remote Sensor you may choose to install it at this time also.

15. Connect any dew straps that you have [See
16. Figure 16, Page 17, item (B and F)].

WARNINIG: Ensure the total resistance meets the specifications provided in Section C on Page3. Astro-Smart is not responsible for failure to heed this warning.

If you purchased the Right-Angle dew strap connector(s) you may choose to install them at this time along with the connection of your dew straps.

17. Install the Remote Sensor at each location under the dew strap with the flat face of the sensor facing the telescope piece [See Figure 14].

Figure 14 Remote Sensor Placement

18. Route the Remote Sensor(s) cables along with the dew strap cables. A convenient way to do this is to braid the two cables together [See Figure 15].

If you have two Remote Sensors route one with the dew strap that is used for your telescope's front corrector. Route the second Remote Sensor cable along with either the dew strap that is used for your eyepieces or your finderscope.

Figure 15 Route Sensor cable with Dew Strap cable

19. Connect the power supply that is 12V 3amp (minimum) [See Section C, Page 3].

3. Front Panel

The front panel contains all the controls the user requires [See Figure 16].

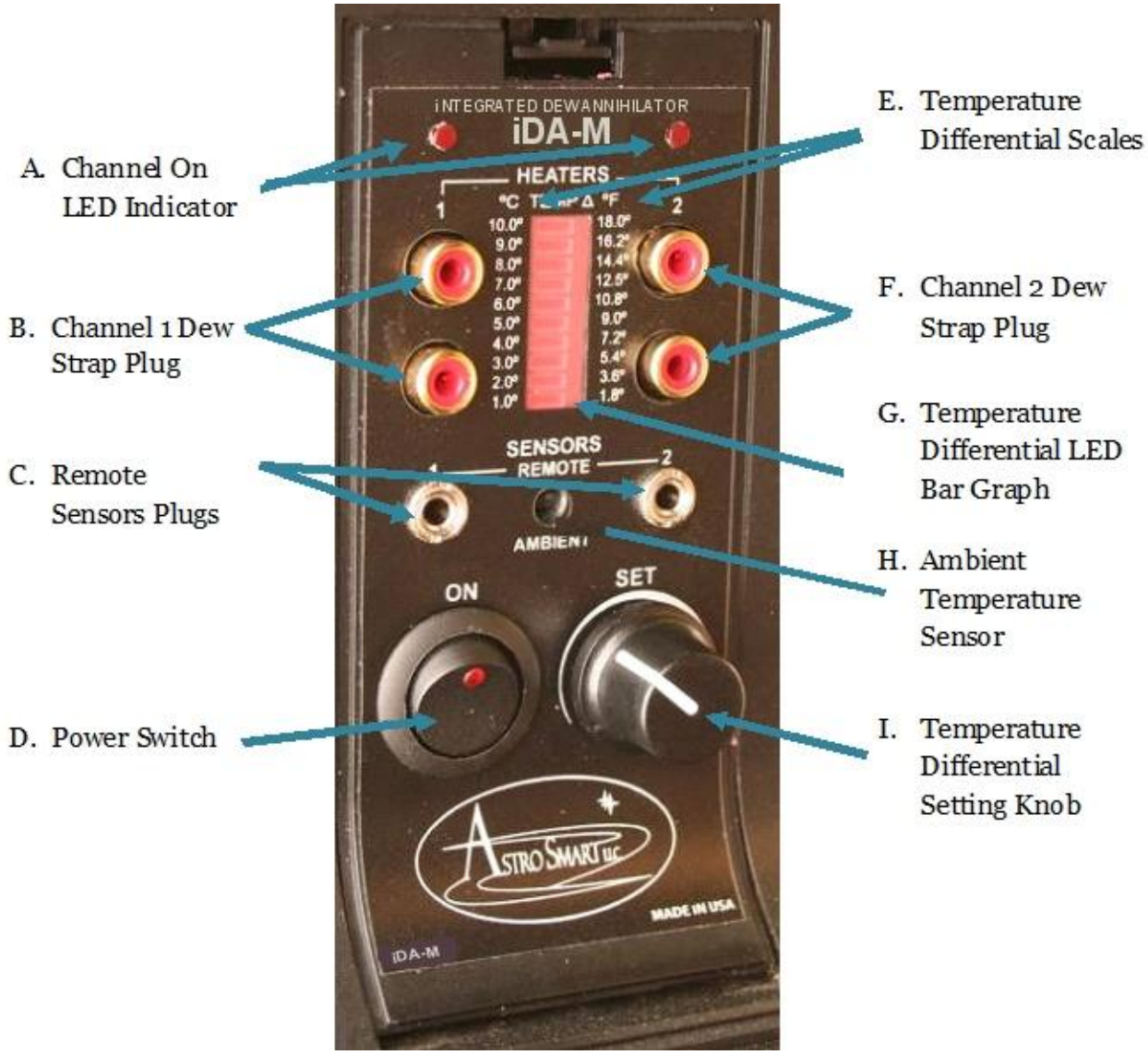

Figure 16 Front Panel Layout

The following are descriptions of each of the major control panel features:

A. Channel-ON LED Indicators: Each of the two dew heater channels has a separate indicator. When the respective Channel is powered ("ON") by the Integrated Dew Annihilator (Model: iDA-M) circuit the appropriate red LED will illuminate. This indicates power is being supplied to the dew straps that are plugged into the respective Channel Dew Strap Plug.
B. Channel 1 Dew Strap Plug: These two plugs provide power to the two dew straps when they are plugged into them. When the Channel-1 On LED Indicator illuminates then there is power supplied to these Channel-1 Dew Strap Plugs. They are standard RCA plugs. Any standard dew strap from astronomical vendors will work with the Integrated Dew Annihilator (Model: iDA-M).
C. Remote Sensor Plugs: The Remote Temperature Sensors are plugged in here. The Integrated Dew Annihilator (Model: iDA-M) comes with one Remote Temperature Sensor. It can be plugged into either Remote Sensor Plug and provide temperature information to both Channels. If the 2nd Remote Temperature Sensor Accessory is purchased and utilized then each Channel will have its own remote sensor.
D. Power Switch: The Power Switch is the main on-off switch for the Integrated Dew Annihilator (Model: iDA-M). In the ON position the Power Switch's internal LED illuminates indicating power is being supplied to the Integrated Dew Annihilator.
E. Temperature Differential Scales: There are two Temperature Differential Scales provided on the front panel. The Temperature Differential Setting is indicated with the Temperature Differential LED Bar Graph (G). The left Scale is in Celsius and the right Scale is in Fahrenheit. The Celsius graduates from 0 to 10 degrees every degree. The Fahrenheit Scale is converted and rounded for each Celsius scale.
F. Channel 2 Dew Strap Plug: See B. above.
G. Temperature Differential LED Bar Graph: This 10 LED bar graph indicates the desired Temperature Differential Setting between the Ambient (H) and Remote (C) Temperature Sensors. Each LED in the bar graph indicates 1 degree Celsius temperature difference set between the two sensors.
H. Ambient Temperature Sensor: This sensor is mounted internal to the Integrated Dew Annihilator (Model: iDA-M) and is visible on the front panel. It senses the ambient temperature for use by the Integrated Dew Annihilator to determine the temperature difference between it and the remote sensors.
I. Temperature Differential Setting Knob: This knob allows the user to set the temperature difference that they wish to use for the activation of power to the dew straps. Turn the knob fully counter-clockwise for no temperature differential and fully clock-wise for maximum 10 degree Celsius temperature differential. Both Channels use the same setting that is made with this knob. The Temperature Differential LED Bar Graph indicates the setting the user has set with this knob. Each degree Celsius is indicted by an LED on the Temperature Differential LED Bar Graph.

4. Operation

Once the Integrated Dew Annihilator (Model: iDA-M), Remote Sensor cable(s), and dew strap cables have been installed according to the procedures in Section 2 starting on Page 8, turn the Integrated Dew Annihilator ON using the Power Switch (D). When the Integrated Dew Annihilator is turned on you will see the Power Switch red LED illuminate. This is the indication that power is being supplied to the Integrated Dew Annihilator circuit and is ready for use. You may see other LEDs lit at this time depending on the setting of the Temperature Differential Setting Knob (I).

Check the weather conditions for your observing site. Note the temperature difference between the ambient temperature and the dew point. If the temperature difference is relatively small, on the order of 5 degrees Fahrenheit or less, you should set the Temperature Difference Setting Knob (I) such that the Temperature Differential LED Bar Graph (G) indicate a setting on the appropriate Temperature Differential Scale (E) that is at least 2 degrees Fahrenheit. The Temperature Differential LED Bar Graph (G) is a visual indicator of the temperature differential setting the user has set with the Temperature Differential Setting Knob (I).

Power is supplied to a Channel(s) when the temperature difference between the Remote Sensor(s) (C) and the Ambient Sensor (H) is greater than the setting of the Temperature Difference Setting Knob (I) indicated by the Temperature Differential LED Bar Graph (G).

You may notice when the Temperature Differential Setting Knob (I) is turned clockwise a small amount from the minimum setting that the Channel ON LED(s) (A) will illuminate but the Temperature Differential LED Bar Graph (G) will not be illuminated. This condition indicates a Temperature Differential Setting of 0.5 degrees Celsius. All other Temperature Differential Settings are indicated in 1 degree Celsius increments.

When only one Remote Temperature Sensor (C) is used, both Channels are controlled by that sensor. A single Remote Temperature Sensor (C) can be plugged into either Channel's Remote Sensor Plug (C). When two Remote Temperature Sensors (C) are used, then each sensor controls the Channel into which it is plugged.

When a Channel's Remote Sensor (C) temperature falls below the sum of the Ambient Sensor (H) temperature plus the Temperature Differential Setting (G), then the Integrated Dew Annihilator (Model: iDA-M) will supply power to the applicable associated Channel's Dew Strap Plugs (B). The Channel ON LED (A) will illuminate ON as the Integrated Dew Annihilator heats the optical elements and OFF as the optical elements heat above the sum of the Ambient Sensor (H) temperature plus the Temperature Differential Setting (G).

G. Accessories

You may use a power supply you already have that meets the specifications listed above, or you may purchase one from Astro-Smart. Our power supplies provide 12v at 3.3amps and will provide years of dependable service along side your Integrated Dew Annihilator (Model: iDA-M).

An optional second remote sensor is available (2RSDDH-M)) [See Figure 17]. This 2nd Remote Sensor allows you to control the heating of separate optical elements. For instance, one remote sensor would be placed with your heater at the corrector. A second sensor could be placed at your eyepiece or finder scope objective lens. In this setup each pair of heaters is controlled by their respective sensor. This allows greater control for the user. This item can be purchased at the same time as you purchase your Integrated Dew Annihilator (Model: iDA-M) or at a later time. If you only use the included remote sensor, then all four heater connectors are controlled by the one sensor; and it can be plugged into either remote sensor jack.

Figure 17 Remote Sensor accessory

Another convenient accessory that Astro-Smart offers is a right angle heater connector (RAHC-DM)) [See Figure 18]. This allows your heater to be connected to the Integrated Dew Annihilator (Model: iDA-M) at a right angle. This may be convenient for you to alleviate any bending that you have of your heater connector and wire.

Figure 18 Right Angle dew strap connector

Please note that when purchasing the Astro-Smart integrated Differential Dew Heater Module (Model: iDA-M), you can use the heater straps you may already have.

Return Policy

All items must be in new (mint) condition. Returned items cannot show evidence of use or wear, dirt, or blemishes of any kind. Merchandise must be returned in its original packaging and should include all supplied materials, instructions, warranty cards, original accessories, hardware, and any software provided. Astro-Smart LLC is not responsible for lost or damaged packages. Return shipping costs are the responsibility of the customer. A **20% restocking fee** will apply to returnable items if they are returned within 15 days of shipment from us. Items must be in "as new" condition and unopened. We ask that you open and inspect your order upon receipt since no insurance or damage claims will be accepted more than three days after delivery. All Customers MUST call before returning products for warranty or repair to get an RMA# (Return Merchandise Authorization) or an SRO# (Service Repair Order) as well as return shipping instructions and return shipping address. Items being returned from the continental US must be sent 'PARCEL POST', unless directed by Astro-Smart LLC to do otherwise. Failure to do so will result in customs and administration charges being charged to the customer's account or the shipment being refused. Product is to be returned with delivery and insurance charges prepaid and these charges are not refundable.

Limited Warranty

Upon receipt of returned product, Astro-Smart LLC will assess the item/s to determine if they comply with the conditions of our warranty. Items that do comply will be fixed or replaced free of charge. Items that are deemed to be out of warranty or have had their warranty voided will, with the customer's knowledge, be fixed at our costs specified below or replaced with new product paid for at full retail value. Please note that items that have been returned for repair or assessment and are deemed to be in proper working order will have a $60.00 bench charge applied as well as return shipping costs. Repairable items that are out of warranty will be charged $70.00 per hour plus parts as well as return shipping costs. Our warranty does not cover damage due to misuse, accidental, incidental or intentional abuse, tampering or the wear and tear of normal use.

Astro-Smart Integrated Dew Annihilator (Model: iDA-M)
Module: 90 days for parts and labor.
Sensors: 90 days for parts and labor.

In no event shall Astro-Smart LLC be liable for any claim for incidental or consequential damage arising out of or in connection, manufacture, delivery or use of any product offered on this website or by information received by US mail, E-mail, data files or fax. Astro-Smart LLC is not responsible for damage caused by the freight carrier, i.e.: UPS, FED EX, etc., to our product. Warranty coverage excludes normal wear and tear, or damage caused by improper installation, any modification, abuse, misuse, improper maintenance, and unauthorized repairs or modifications to the original product. Warranty does not cover those parts prone to failure under normal wear and tear. Any product repair request must be submitted and approved before shipment to Astro-Smart LLC. Shipper is responsible for proper packaging, shipping and insurance on approved repair items.